

CULTIVATION OF VHOKHLA - A LOCAL ISOLATE OF *VICIA FAVA* TO MEET THE DEFICIT IN PULSE PRODUCTION

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Abstract: People of a very remote part of West Bengal, a state of India, traditionally cultivate a local isolate of *Vicia faba* from ancient days at their fallow lands. The plant is accustomed with the agro-climatic condition of that area and is resistant to pests and grazing of animals. The pulse produced by this plant is very cheap for its very low production cost and it contains a high percentage of protein of a very good quality along with other nutrients. Cultivation of this pulse producing plant may be encouraged for the supply of a very good quality protein at a very cheap rate to our poor people and can be used as a protein rich concentrate of animal ration, as an alternative base material for various fried food preparations or as a meat extender or a skim milk substitute. By taking measures for large scale cultivation and marketing, it can help to meet the deficit in pulse production of our country along with other economic benefits.

Keywords: *Vicia faba*, local isolate, cultivation, cheap pulse.

Introduction

India is deficient in pulse production to meet demand of its people. Many Indian, particularly at rural areas, cannot purchase costly proteinous food from the market and thereby subject to mal nutrition leading to low immunity status of the body and suffering from various types of illness. The pregnant mothers and the children are the most common victim of protein deficiency. The population growth rate of India is so high that there is a continuous pressure for supply of more food, particularly protein at a low cost.

Animal protein production needs much investment and so it is costly. The sources of animal protein (milk, meat etc.) require good animal husbandry practices. For proper growth and production, animals also need good quality of vegetable protein (mainly pulses) in their diet. On the other hand, the common pulses available in the market are of high price. So the search for a protein rich pulse at a low cost is always desirable.

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People of a very remote part of Murshidabad district of West Bengal, India, traditionally cultivate “Vhokhla” in their fallow land. The seeds of the plant (actually the pulse of *Vicia faba*) are also sold at local village market. As the production cost of this is very low, the pulse is sold at a very low price. This pulse can be popularized as a new source of vegetable protein by inducing large scale cultivation and marketing.

Cultivation of *Vicia faba*

In the particular area of Murshidabad district of West Bengal, India, the seeds of *V. faba* are generally planted at various types of fallow land like the land under shade of trees, land surrounding the plots of paddy or wheat cultivation, pond, dwellings etc. So, the cultivation of this plant does not compete with normal agricultural practices at any way. Cow dung is the only manure used in such cultivation.

In very few cases, cultivation is performed on agricultural land. The time schedule for cultivation of *V. faba* is as like as that of wheat. When cultivation is performed on agricultural field, the land is tilled and a moderate level of moisture is supplied. Then 30-35 kg. of seed along with 150 kg. of phosphate, 30 kg of urea and 30 kg of potash are sown per acre of land and ladder is applied. Moisturization is performed after 20-25 days of sowing of seeds. Sometimes a second time moisturization is required after another one month. The maturity period is 90-100 days.

Insect infestation report during any stage of cultivation of this plant is rare. Eating of plants by grazing animals is a common problem in agricultural practices of rural Bengal, however, due to presence of any unpalatable flavour grazing animals (including goat) do not eat this plant.

During searching of information regarding cultivation of *Vicia faba* in other areas, it is found that it can tolerate nearly any soil type, grows best on rich loams. A moderate moisture supply is necessary. Optimum temperature for production ranges vary from 18⁰C-27⁰C (Duke, 1981). Evenly distributed rainfall of 650-1000 mm per annum is ideal (Kay, 1979). The maturity period ranges from 90-220 days depending upon the cultivators and climatic conditions (Bond et.al, 1985). Our observations do not differ from these data.

The plant grows up to 50-90 cm in height. They bear numerous initially upright pods in the axils of the leaves along the stem. At maturity, the pods are slightly rounded about 2 cm in width and 15 cm or more in length. Each cluster contains five or more fleshy beans.

Yield: The average yield, as calculated from the data supplied by the farmers, is 1200-1500 kg pulse per acre of land.

Use: The beans of *Vicia faba* are generally used as a pulse after complete maturity, but sometimes the immature beans are also used as green vegetable. The flour prepared from the beans is also used to prepare various types of fried food preparation, an alternative of gram powder, ‘Beson’.

Estimation of nutrients

The report of our laboratory analysis of three different samples is given in the table.

Table : Result of Proximate Analysis of *V. Fava* (%)

Average moisture	8.7229%	Ether Extract	
Total Ash		a.Sample A	2.15%
a.Sample A	3.6%	b. Sample B	1.56%
b.Sample B	3.1%	c. Sample C	2.91%
c.Sample C	3.35%	Average	2.18%
Average	3.35%		
Crude Fibre		Crude Protein	
a. Sample A	5.9%	a.Sample A	23.33%
b. Sample B	6.8%	b. Sample B	23.625%
c. Sample C	6.1%	c. Sample C	22.16%
Average	6.266%	Average	23.038%

Chemistry

Wide variation of protein content (20-41%) has been reported in various studies (Chavan et.al, 1989). Protein concentration in *V. fava* is influenced by both genetic and environmental factors (Bond et.al, 1985). The whole dry seed content (per 100 gm) 344 calories, 10.1% moisture, 26.2 gm protein, 1.3 gm fat, 59.4 gm total carbohydrate, 6.8 gm fiber, 3.0 gm ash, 104 mg calcium, 301 mg phosphorus, 6.7 mg iron, 8 mg sodium, 1123 mg potassium, 130ug -Carotine equivalent, 0.38 mg thiamine, 0.24 mg riboflavin, 2.1 mg niacin, 162 mg tryptophane and 16mg ascorbic acid (Duke, 1981). Utilizable protein, protein digestibility and biological value are reported to vary from 14.8-15.5%, 82-92% and 45-55 % respectively (Hulse ,1994).

The flour prepared from *V. fava* contains 340 calories, 12.4% moisture. 25.5 gm protein, 1.5 gm fat, 58.8 gm total carbohydrate, 1.5 gm fiber, 1.8 gm ash, 66 mg Calcium, 354 mg phosphorus, 6.3 mg iron, 0.42 mg thiamine, 0.28 mg riboflavin, and 2.7 mg niacin. Immature seeds contain 75 calories, 76.3% moisture, 7.1 gm protein, 0.4 gm fat, 15.3 gm total carbohydrate, 3.2 gm fiber, 0.9 gm ash, 38 mg calcium, 127 mg phosphorus, 0.1 mg thiamin, 0.22 mg riboflavin and 140 mg ascorbic acid 100 grams (Duke, 1981).

In our study, sample marked as 'a' and 'c' are taken from the plots surrounding the wheat field. The sample marked as 'b' is taken from a fallow land.

It appears from our laboratory study that the percentage of total ash and ether extract is lowest in the sample of fallow land, but crude fiber and crude protein percentage is highest in this sample. This may be due to supply of nitrogenous fertilizer by application of organic manure (cow dung) at higher level than the plots surrounding the wheat field. The difference in percentage of various ingredients in three samples is not wide and is *at par* with those of literatures.

In the pulse or flour, the amino acid content averages (mg/gN) isoleucine 250, leucine 443, lysine 404, phenylalanine 270, tyrosine 200, methionine 46, cystine 50, threonine 210, valine 275, arginine 556, histidine 148, alanine 259, aspartic acid 702, glutamic acid 942, glycine 258, proline 249 and serine 280. The fatty acid composition of oil prepared from this bean has been reported as 88.6% unsaturated (Oleic 45.8%, linoleic 30% and linolenic 12.8%) and 11.4 % saturated (8.2% stearic). cholesterol (0.04%) and lipoxxygenase are also reported (Duke, 1981).

Toxic substances

Hemagglutinin (lectin) concentration in this bean is comparatively higher than other beans. These substances are destroyed by heat during normal food preparation (Hussein et.al, 1985).

Raw beans contain vicine, isouramil and convicine which can induce haemolytic anaemia in patients with the hereditary condition of glucose 6-phosphate dehydrogenase deficiency. This potentially fatal condition is called as "favism" (Parson, 1996), but it is uncommon in cooked beans (Lawes,1980). It is also rich in tyramine, and thus should be avoided by those taking monoamine oxidase (MAO) inhibitors. This is rich in L-dopa, used medically in the treatment of Parkinson's disease (Holden).

Discussion

Vicia faba is used as an important food item from a very primitive stage of human civilization. It is believed that it became part of eastern Mediterranean diet in around 6000 BC or earlier. These are still often grown as a cover crop to prevent erosion in many cold countries because they can also fixed nitrogen in the soil (Wikipedia). Faba bean production in the world is concentrated in nine major agro ecological regions, namely, Northern Europe, Mediterian, Nile valley, Ethiopia, Central Asia, East Asia, Oceania, Latin America and North America (Bond et.al, 1985).

The local isolate identified by us is devoid of any history of parasitic, bacterial or fungal infestation and that is also accustomed with the soil and weather of the area. So, the cultivation of this plant is very easy.

The pulse is sold at a rate of Rs.15-20 per kilogram in the local market, which is 1/4th to 1/5th of the cost of other available common pulses.



1. *Vicia faba* cultivation in field



2. Herbarium of *Vicia faba*



3. Pods of *Vicia faba*



4. *Vicia faba* seed

As this bean is having a good percentage of protein of high quality due to the presence of many essential amino acids and also other nutrients, this can be recommended as another source of good quality pulse for people. This bean can be used for preparation of various types of cooked food items, or flour prepared from it may be used as a good alternative of flour of gram (Beson) - the base material for preparation of many famous fried fast foods. The bean can also be included in the ration of cattle and poultry as a protein rich concentrate. Faba bean has been considered as a meat extender or substitute and also as a skim milk substitute (Duke, 1981). So, this bean may also be used as an alternative of soyabean (*Glycin max* L) in preparation of food items.

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